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Status of the Claims

Please amend claims 1-24 and 26-28; and withdraw claims 19-29; all without prejudice or disclaimer, as indicated in the following Listing of Claims.

Listing of Claims

1. (Currently amended) A drive circuit (~~20a,20b~~) for an injector arrangement having at least one injector (~~12a,12b~~), the drive circuit comprising:
  - a first charge storage means device configured and arranged (~~C2~~) for operative connection with one of the at least one injectors (~~12a,12b~~) during a discharging phase so as to permit a discharge current to flow therethrough, thereby to initiate an injection event;
  - a second charge storage means device configured and arranged (~~C1~~) for operative connection with the at least one injector (~~12a,12b~~) during a charging phase so as to cause a charge current to flow therethrough, thereby to terminate the injection event;
  - a switch controller means (~~Q1,Q2~~) configured and arranged for controlling whether the first charge storage means device (~~C2~~) is operably connected to the at least one injector or whether the second charge storage means device (~~C1~~) is operably connected to the at least one injector;
  - a first voltage rail (~~V-sub.0,V-sub.supply~~) at a first voltage level;
  - a second voltage rail (~~V-sub.1~~) at a second voltage level higher than the first voltage level;
  - a voltage supply means (~~22,36~~); and
  - a regeneration switch means (~~Q5,Q2,L1~~) configured and arranged to be operable at the end of the charging phase to transfer charge from the voltage supply means to at least the second charge storage device via an energy storage device (~~L1~~), prior to a subsequent discharging phase.
2. (Currently amended) The drive circuit (~~20a,20b~~) as claimed in claim 1, wherein the first charge storage means device (~~C2~~) is connected across the first voltage rail (~~V-sub.0,V-sub.supply~~) and ground.

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3. (Currently amended) The drive circuit (~~20a, 20b~~) as claimed in claim 1 ~~or claim~~ 2, wherein the second charge storage means device (~~C1~~) is connected across the first (~~V.sub.0, V.sub.supply~~) and second (~~V.sub.1~~) voltage rails.

4. (Currently amended) The drive circuit (~~20a, 20b~~) as claimed in ~~any preceding~~ claim 1, further comprising a switch means arrangement including a first switch (~~Q1~~) operable to close so as to activate the charging phase, and a second switch (~~Q2~~) operable to close so as to activate the discharging phase.

5. (Currently amended) The drive circuit (~~20a~~) as claimed in ~~any preceding~~ claim 4, wherein the regeneration switch means (~~Q5, Q2, L1~~) is operable at the end of the charging phase to transfer charge from the voltage supply means (~~22~~) to the first charge storage means device (~~C2~~) and the second charge storage means device (~~C1~~).

6. (Currently amended) The drive circuit (~~20b~~) as claimed in ~~any of claims 1 to 4~~, wherein the regeneration switch means (~~Q5, Q2, L1~~) is operable at the end of the charging phase to transfer charge from the voltage supply means to the first charge storage means device (~~C2~~), and from the first charge storage means device (~~C2~~) to the second charge storage means device (~~C1~~) via the energy storage device (~~L1~~).

7. (Currently amended) The drive circuit (~~20a~~) as claimed in claim 5, wherein the regeneration switch means (~~Q5, Q2, L1~~) is operable to transfer charge from the voltage supply means (~~22~~) to the first (~~C2~~) and second (~~C1~~) charge storage means devices in response to the operation of the second switch (~~Q2~~) during the regeneration phase.

8. (Currently amended) The drive circuit (~~20b~~) as claimed in claim 6, wherein the regeneration switch means (~~Q5, Q2, L1~~) is operable to transfer charge from the voltage supply means (~~22, 36~~) to the first charge storage means device (~~C2~~) in response to the operation of the second switch (~~Q2~~) during the regeneration phase.

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9. **(Currently amended)** The drive circuit (~~20a,20b~~) as claimed in ~~any preceding~~ claim 1, wherein the first (~~C2~~) and second (~~C1~~) charge storage ~~means~~ devices comprise capacitors.

10. **(Currently amended)** The drive circuit (~~20a,20b~~) as claimed in ~~any preceding~~ claim 1, further comprising first (~~12a~~) and second (~~12b~~) injectors ~~which~~ that are arranged in parallel and operatively connected to the switch ~~means~~ controller (~~Q1,Q2~~), the regeneration switch ~~means~~ (~~Q5,Q2,L1~~), and a further switch ~~means~~ (~~Q3,Q4~~) for controlling independent selection of the first (~~12a~~) or second (~~12b~~) injector to permit a discharge current to be supplied to the selected injector (~~12a,12b~~) during a discharging phase so as to initiate an injection event.

11. **(Currently amended)** The drive circuit (~~20a,20b~~) as claimed in claim 10, wherein the drive circuit is substantially configured as a half H-bridge circuit having a middle circuit branch (~~32~~), with the first (~~12a~~) and second (~~12b~~) injectors being arranged in parallel in the middle circuit branch.

12. **(Currently amended)** The drive circuit (~~20a,20b~~) as claimed in claim 10 ~~or~~ ~~claim 11~~, further comprising a voltage sensing ~~means~~ sensor configured and arranged for sensing the voltage across each injector (~~12a,12b~~), and a control ~~means~~ configured and arranged for receiving a signal indicative of the sensed voltage.

13. **(Currently amended)** The drive circuit (~~20a,20b~~) as claimed in claim 12, wherein the control ~~means~~ is arranged to provide a terminate control signal to the further switch ~~means~~ (~~Q3,Q4~~) to terminate the charging phase of the selected injector once a predetermined charge threshold voltage (~~V<sub>sub</sub>.CHARGE~~) is sensed.

14. **(Currently amended)** The drive circuit (~~20a,20b~~) as claimed in claim 13, wherein the control ~~means~~ is further arranged to provide an initiate signal to the switch ~~means~~ controller (~~Q1,Q2~~) to initiate the charging phase of the selected injector.

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15. **(Currently amended)** The drive circuit ~~(20a,20b)~~ as claimed in claim 13 or claim 14, wherein the control means is arranged to provide an initiate signal to the regeneration switch means ~~(Q5,Q2,L1)~~ to initiate the regeneration phase, and to provide a termination signal to the regeneration switch means to terminate the regeneration phase.

16. **(Currently amended)** The drive circuit ~~(20a,20b)~~ as claimed in claim 14, wherein the control means is further arranged to provide a terminate control signal to the further switch means ~~(Q3,Q4)~~ to terminate the discharging phase of the selected injector once a predetermined discharge threshold voltage ( ~~$V_{\text{sub-DISCHARGE}}$~~ ) is sensed.

17. **(Currently amended)** The drive circuit ~~(20a,20b)~~ as claimed in claim 16, wherein the control means is further arranged to provide an initiate control signal to the switch means controller ~~(Q1,Q2)~~ to initiate the discharging phase of the selected injector.

18. **(Currently amended)** The drive circuit ~~(20a,20b)~~ as claimed in any of claims 12 to 17, wherein the control means is arranged to provide a pulse width modulated signal to alternately provide enable and disable signals to the switch means controller ~~(Q2)~~ during the regeneration phase, thereby to transfer energy to and from the energy storage device ~~(L1)~~.

19. **(Withdrawn and currently amended)** The drive circuit ~~(20a,20b)~~ as claimed in any preceding claim 1, wherein the at least one injector ~~(12a,12b)~~ comprises a piezoelectric actuator.

20. **(Withdrawn and currently amended)** A control method for an injector arrangement having at least one injector ~~(12a,12b)~~, the method comprising:

operably connecting a first charge storage means device ~~(C2)~~ to one of the at least one injectors during a discharging phase so as to cause a discharge current to flow therethrough, thereby to initiate an injection event;

operably connecting a second charge storage means device ~~(C1)~~ with the at least one injector during a charging phase so as to cause a charge current to flow therethrough, thereby to terminate the injection event;

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activating a regeneration switch ~~means (Q5, Q2)~~ at the end of the charging phase to initiate a regeneration phase wherein charge is transferred from a voltage supply ~~means (22, 36)~~ to an energy storage device (~~L1~~), and transferred from the energy storage device (~~L1~~) to at least the second charge storage ~~means device (C1)~~ prior to the subsequent discharging phase; and deactivating the regeneration switch ~~means~~ to terminate the regeneration phase.

21. **(Withdrawn and currently amended)** The control method as claimed in claim 20, wherein during the activating step charge is transferred from the voltage supply ~~means (22)~~ to the energy storage device (~~L1~~), and subsequently transferred from the energy storage device (~~L1~~) to the first (~~C2~~) and second (~~C1~~) charge storage ~~means devices~~.

22. **(Withdrawn and currently amended)** The control method as claimed in claim 20, wherein during the activating step charge is transferred from the voltage supply ~~means (22)~~ to the first charge storage ~~means device (C2)~~, and subsequently transferred from the first charge storage ~~means device (C2)~~ to the energy storage device (~~L1~~) for transfer to the second charge storage ~~means device (C1)~~.

23. **(Withdrawn and currently amended)** The control method as claimed in ~~any of~~ claims 20 to 22, wherein the steps of transferring charge to and from the energy storage device (~~L1~~) are carried out periodically.

24. **(Withdrawn and currently amended)** The control method as claimed in claim 23, wherein the steps of transferring charge to and from the energy storage device (~~L1~~) are carried out under the control of a pulse-width modulated signal.

25. **(Withdrawn)** The control method as claimed in claim 24, including the further step of varying the duty cycle of the pulse width modulated signal.

26. **(Withdrawn and currently amended)** The control method as claimed in ~~any of~~ claims 20 to 25, including the further step of controlling whether the first (~~C2~~) or second (~~C1~~) charge storage ~~means device~~ is operably connected to the at least one injector (~~12a, 12b~~).

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27. **(Withdrawn and currently amended)** The control method as claimed in ~~any of~~ claims 20 ~~to 26~~, including the further step of providing a regeneration initiate signal to activate the regeneration switch ~~means (Q5, Q2)~~ so as to initiate the regeneration phase.

28. **(Withdrawn and currently amended)** The control method as claimed in claim 27, including the further step of providing a regeneration terminate signal to deactivate the regeneration switch ~~means (Q5, Q2)~~ so as to terminate the regeneration phase.

29. **(Withdrawn)** The control method as claimed in claim 27, wherein the regeneration initiate signal is provided after a predetermined number of injection events.